Thornton Tomasetti

Memorandum

TO	Sean Hanlon (Holland & Hart) Shaun Kennedy (Holland & Hart) Thomas Morales (Holland & Hart)	FROM	Michael Oakland, Ph.D.
COMPANY	Holland & Hart LLP	DATE	April 15, 2021
RE	Expert Report Pile Installation Differing Site Condition	PROJECT NO	NN20078.00
CC	Leo Fernandez	PROJECT NAME	South Fork Shoshone River Bridge, South Fork County, WY

Thornton Tomasetti, Inc. (TT) was retained by Holland & Hart to provide expert engineering services related to the pile installation for the replacement South Fork Shoshone River Bridge (South Fork Bridge) Project in South Fork County, Wyoming. The project was designed by the Federal Highway Administration (FHWA) and bid as to construction firms with no required design responsibilities as part of the work. This is known as a design-bid-build project.

The new bridge is a single span with pile supported abutments at each end. Each abutment was to be supported by 6 HP 14x102 H-piles with a required driven resistance of 435 kips at Abutment No. 1 and 415 kips at Abutment No. 2. The FHWA self-performed the geotechnical investigation that included a single test boring at each abutment. The test borings were drilled to a depth of 80 ft. and 90 ft. at abutments No. 1 and 2 respectfully using an ODEX drilling system. The ODEX system had difficulty controlling heave within the boreholes which resulted in sampling and Standard Penetration Testing (SPT) being missed throughout much of the depth of the test borings.

The Southfork Road, Park County, WY Final Geotechnical Report dated December 21, 2018 ("Geotechnical Report") indicates that the subsurface conditions consist of about 8 ft. to 12 ft. of fill underlain by about 7 ft. of low plasticity silty, clayey sand to sandy silt. The sandy silt layer was underlain by medium dense poorly graded sand to a depth of about 52 ft. to 53 ft. The site is underlain by a fine grained sand which graded to a sandy silt to the depth of the explorations, about 90 ft. Groundwater was encountered at depth of about 14 ft. to 17 ft. below grade.

The Geotechnical Report prepared specifically for this project by the FHWA further states in Note 3 on Table 4.2 of the report that "the required axial resistance is expected to be reached at elevations [("El.")] 6,057 and 6,053 for abutments 1 and 2, respectively." However, the table further states that the minimum tip elevation is 6,047 for Abutment No. 1 and 6,045 for Abutment No. 2 based on "comparison of axial requirements in the strength limit state and extreme event state, settlement and lateral load requirements" as stated in Note 2 on the table. With cutoff for the piles at about El. 6087 at Abutment No. 1 and El. 6085 at Abutment No. 2, this would have resulted in a 40 ft. long pile at both abutments. This is confirmed in the Geotechnical Report that states that the estimated pile length is 40 ft. For this length, based on the analysis performed by the FHWA's geotechnical engineer and reported in the Geotechnical Report, the axial resistance should have been met 10 ft. above the required tip for Abutment No. 1 and 8 ft. above the required tip for Abutment No. 2. This is a contingency of 33 percent additional length at Abutment No. 1 and 25 percent additional length at Abutment No. 2 over what was expected to be required in the FHWA's Geotechnical Report to obtain axial capacity.

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The pile lengths, as determined by the Geotechnical Report were then translated into bid quantities in the Invitation to Bid which specifically called out 500 lineal feet of HP 14x102 H-Pile to be included as a bid item for the 12 piles or approximately 41.7 ft. per pile. The bid items also included two dynamic pile load tests to be included in the bid. These were fixed fee prices that are matched to a defined quantity of piles and load tests in the bid.

The determination of the various minimum tip elevations is explained in the paragraph below the table stating that the software program APILE was used to determine the axial resistances and that the structural engineer calculated the minimum tip elevations for lateral resistance which actually control the length requirements of the piles. While the Geotechnical Report, in Section 4.1.5, does give the parameters to be used in an L-Pile analysis to determine the lateral load resistance of the pile, it clearly states that this is to be performed by the CFL (Central Federal Lands, a Division of the FHWA) Bridge Engineer. The report shows plots of the axial analysis by the APILE program, but does not provide any parameters or even a recommended side adhesion or tip resistance to be used to allow others to compute or check the analysis of vertical capacity.

Mountain Construction was awarded the construction contract for the replacement bridge (the "Prime Contract"). Mountain Construction awarded FirstMark the Subcontract to install the pile foundations and erect the new bridge (the "Subcontract"). For the foundation construction, FirstMark provided 44 ft. long piles that exceeded the bid quantity required by the contract. In the end, the piles at Abutment No.1 drove to depths of approximately 83 ft. to 86 ft. below cutoff before achieving the required resistance. This was about 205 percent over the bid quantity and about 285 percent over what the FHWA's geotechnical engineer expected to be required to achieve axial resistance. The piles at Abutment No. 2 drove to depths of 94 ft. to 101 ft. below cutoff before achieving the required resistance. At this abutment, the lengths were about 230 percent over the bid quantity and about 300 percent over what the FHWA's geotechnical engineer expected to be required to achieve axial resistance.

This additional, unanticipated length of pile resulted in FirstMark having to purchase and splice substantial additional H-Pile quantity, obtain a different pile driving hammer and crane to accommodate the additional pile length and conduct numerous additional dynamic load tests to help determine the actual depth required to achieve the required axial resistance. There was no requirement in the Subcontract that FirstMark was to make any independent analysis of depth and information to allow it to make these analyses, even if FirstMark retained an engineer to do so, it would not have been able to do so because the Geotechnical Report lacked information related to the assumed axial pile capacity parameters.

This additional pile length and all related costs to install the longer piles is a clear Type 1 differing site condition to the contract. Type 1 differing site conditions are defined under 48 C.F.R. 52.236.2 ("FAR" 52.236.2) Differing Site Conditions (Apr. 1984) which is explicitly incorporated in the Invitation to Bid.

1.0 Document Review and Exhibits

In preparation of this memorandum, TT reviewed the following project documents which TT may use as exhibits or rely on to support its expert opinion:

Table 1: Received Documents

Date	Document Title	Designer/Author	Bates Number
4/22/2019	Standard Subcontract Agreement	Mountain Construction Company	FMC 000229-000231
12/21/2018	Southfork Road, Park County, WY Final Geotechnical Report	Geotechnical Services Branch, Federal Highway Administration	FHWA002533-2586
Spring 2019	Invitation for Bid	Federal Highway Administration	FMC000021-228
7/27/2019	FHWA Transmittal Approving Vibro Installation to Q200 Elevation	Federal Highway Administration	FMC005006-5009
7/19/2019	Wave Equation Analysis – Movax DH-45 Hammer	SK Geotechnical	FMC005010-5015
8/21/2019	Dynamic Pile Load Test Report – Abutment 1	SK Geotechnical	FMC005023-5048
8/23/2019	Revised Wave Equation Analysis Delmag D30-32 Hammer	SK Geotechnical	FMC005016-5022
9/26/2019	Dynamic Pile Load Test Report – Abutment 2	SK Geotechnical	FMC004978-5005
9/19/2019	Letter on Pile Driving Concerns	Federal Highway Administration	FMC002721-2723
Various	Pile Driving Logs – Abutments 1 and 2	Element Materials Testing	FMC004972-4977, FMC002499-2506
Undated	FP-14	FHWA	FHWA001567-2328

2.0 Time History of Foundation Construction

The following is an approximate timeline of activities related to pile installation for the replacement South Fork Bridge.

April 22, 2019 FirstMark contracts with Mountain Construction to perform foundation installation and bridge erection construction for the South Fork Bridge Project

July 2019	FirstMark prepares to mobilize pile driving equipment to the site and performs preliminary WEAP Analysis for developing installation criteria and hammer selection
July 22, 2019	FirstMark submitted Pile Driving Plan including use of Movax DH45 hammer
July 27, 2019	FHWA Approves the use of vibratory hammer to drive to piles to Q200 depth
July 31, 2019	Drive Test Pile No. 3 at Abutment No. 1 using Movax DH45 PDA at Design Depth of El. 6047.1 failed to reach capacity PDA at FHWA directed increased depth of El. 6005.1 failed to reach capacity
Aug 8, 2019	Conducted Restrike after set at depth of El. 6005.1 met required capacity
Aug 19, 2019	FHWA directs FirstMark to use alternate pile driving equipment for remaining piles
Late August	FirstMark installs all remaining piles to a depth of about 40 ft. using Movax DH45 hammer while working to mobilize a crane and pile driving hammer to install longer piles required to meet actual site conditions
Early Sept	FirstMark continues driving piles at Abutment No. 2 to about 80 ft. using Delmag D30-32 hammer
Sept 6, 2019	FirstMark continues Test Pile No. 3 at Abutment No. 2 using Delmag D30-32 hammer PDA at extend depth of El. 6002 (similar to Abutment 1) but unable to reach capacity
Sept 7, 2019	FirstMark continues to drive extended test pile at Abutment No. 2 using Delmag D30-32 hammer PDA at extended depth of El. 5985.5 and met required capacity
Sept 2019	FirstMark completes driving of piles in Abutment No. 1 and No. 2 to depths and blow count using Delmag D30-32 hammer to meet required capacities.

3.0 Discussion and Conclusions

Differing site conditions are recognized as two distinct types. Type 1 differing site conditions are unknown or hidden, concealed, or latent physical conditions, which a contractor encounters at the site that differs materially from the conditions indicated in the contract documents. Type 1 differing site conditions occur when drawings, specifications or other contract documents make representations that either expressly or impliedly indicate the expected conditions are different than what actually exists. Type 2 differing site conditions are an unknown, unusual, and

hidden, concealed or latent physical conditions, which the contractor encounters at the site that differs materially from the condition that an ordinary contractor in the general vicinity of the project would expect to encounter while performing work of the same type and character called for in the contract.

For the South Fork Bridge contract, the Geotechnical Engineering Report prepared by the FHWA establishes that a 40 ft. long pile would be adequate to achieve the axial capacities require at both abutments. The geotechnical report defines the depth requirement several times in the report in terms of both the tip elevation as well as the anticipated pile length directly. The Geotechnical Report definitively stated the pile length requirements and included no qualifiers that any additional investigation or testing were necessary. FirstMark, as a subcontractor, was neither permitted nor required to undertake any supplemental geotechnical engineering investigations. It is not customary to require a prime contractor or any of its subcontractors under a design-bid-build project delivery method to undertake such additional geotechnical investigations (and no such additional geotechnical investigations were indicated in Mountain Construction's bid). Therefore, there is no reason that FirstMark or any other pile installation contractor would have (or should have) conducted supplemental investigations for this project.

It is understood that the Geotechnical Report is not part of the contractual documents and is provided for reference to the Contractor. However, this estimate of required pile length from the Geotechnical Report was then included in the Prime Contract documents both on the drawings and directly in terms of bid quantities. The total bid item for the piles is 500 lineal feet for the 12 piles plus two dynamic load tests. This translates to about 41.7 lineal feet per pile plus one dynamic load test at each abutment. But the actual as-installed lengths were between 205 and 230 percent longer than indicated on the Prime Contract documents. This is materially different than the documents indicated and meets the definition of a Type 1 differing site condition. The fact that the FHWA required the Contractor to install the piles to obtain the required resistance is separate from the issue of differing site conditions. The piles installed needed to meet the resistance requirements. But that does not change the fact that FirstMark encountered a Type I differing site condition in the process of installing the piles that increased FirstMark's costs and the time required to install the piles as a result.

The Prime Contract itself, in the invitation for bid, specifically states that FAR 48 CFR 52.236-2 Differing Site Conditions is part of the construction agreement. This regulation specifically states that, provided prompt notification is provided:

> *If the conditions do materially so differ and cause and increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.*

As it applies to the pile installation for the South Fork Bridge, prompt notification was provided as is evident by the FHWA letter on Pile Driving Concerns. This letter responded to the issues just days after the differing site conditions were identified as a result of the PDA and CAPWAP

analysis showing that capacity was not met at the 40 ft. depth or even at the 80 ft. depth upon initial driving at Abutment No. 1 showing that FHWA was aware of the conditions. The increased pile lengths are so materially different from what was represented in the Prime contract and Subcontract documents. Finally, these conditions directly caused an increase in FirstMark's cost in terms of materials, equipment required to drive the longer piles, additional dynamic load tests, time and other related construction costs.

The bid document did not contain any provisions to accommodate or mitigate the potential for piles being driven deeper than the bid quantity. The quantity is consistent with the drawings that are consistent with the Geotechnical Report. The project specification, FP-14 Section 551, does not have any requirements that supersede the pile length shown on the Prime Contract drawings and bid quantities. The only provision in the specification that refers to a particular length of steel piles is FP-14 Section 551.10 (b). That section requires piles up to 60 ft. to be furnished as un-spliced sections. FirstMark complied with Section 551.10(b) by providing 44 ft. un-spliced sections to accommodate the 40 ft. design length.

The specifications, including Section 551.10 (b), do not require procurement of equipment capable of driving piles longer than the bid quantity. It is completely reasonable that FirstMark would select equipment most economical to install the piles as shown on the Prime Contract documents. The combination of vibratory hammer and a lightweight impact hammer were highly suitable for the lengths anticipated at the time of the bid. FirstMark's plan to standup and drive the 40 ft. pile using the vibratory hammer to a height reachable by the excavator mounted impact hammer (specified to be no deeper than the scour depth) was reasonable. This combination is commonly used as it provides lightweight equipment which can easily move between the two abutments. Once the piles became longer and a second 40 ft. spiced section was needed, the pile was too deep to drive with the vibratory hammer. Plus, this would have involved using the vibratory hammer to drive the pile below the scour depth which was not allowed and however, the spliced section was too high to reach by the excavator mounted impact hammer. Thus, a crane mounted impact hammer became necessary. This meant mobilizing a larger, less maneuverable crane with a larger hammer to complete the work.

If the designer, or even the General Contractor, Mountain Construction, was unsure of the required pile length, they could have specified that the equipment mobilized be capable of driving piles to a specific length over the bid quantity. Of course, this would have been reflected in FirstMark's bid price along with the price of any competitive bidders. But no such requirements to mobilize equipment larger than required for the length specified in the documents were ever presented to FirstMark at the time of the bid.

In conclusion, the significant and material additional length of pile required to achieve the required axial capacity is a clear Type 1 differing site condition. The FHWA provided the expected pile lengths numerous times through the Geotechnical Report and in the Prime Contract documents. FirstMark had every right to rely on that information in making its competitive bid. This was not a design build contract and there was no expectation or requirement that FirstMark retain an engineer to independently review or modify the FHWA's Geotechnical Report. Even if FirstMark had wanted to do so, the Geotechnical Engineering report lacked information related to the

assumed axial pile capacity parameters necessary to do so. Further, the limited SPT data provided for the test borings would have made developing these parameters difficult. While FirstMark did conduct WEAP analyses, these were used for hammer selection and confirming that the piles would not be overstressed during driving. WEAP is not intended to be a tool for determining the length of pile required.

The Type 1 differing site condition is independent and separate from the requirement to install the piles to meet the required axial capacities. The fact that piles must be driven to meet axial capacities does not change the reality that FirstMark encountered Type 1 differing site conditions causing increased costs and requiring additional time to drive the piles. In fact, the Prime Contract (as incorporated by the Subcontract) specifically allows for compensation to FirstMark for differing site conditions under FAR 48 CFR 52.236-2 which was incorporated into FirstMark's subcontract. FirstMark met all of the criteria to qualify for additional compensation and time due to the Type 1 differing site conditions it encountered during pile installation. It is our expert opinion that the conditions encountered during the pile installation for the South Fork Road Replacement Bridge construction are a Type 1 differing site condition and that within the terms of the Subcontract FirstMark is owed additional compensation and time for the increased work and alternate equipment required as a result of the differing site conditions.

4.0 Expert Testimony and CV

Dr. Oakland's hourly rate associated with work on this matter is $360/hour.

Dr. Oakland has provided the following sworn testimony within the last 5 years as follows:

Deposition and Trial, Jenco Construction, Inc. vs. City of Des Moines and Shuck-Britson, Inc., Grand Avenue Bridge Abutment Pile Installation, Des Moines, IA. Expert witness to evaluate claim by contractor regarding differing site conditions during sheet pile and H-Pile installation for a bridge replacement over a river.

Deposition and Trial, Triple R Paving, Inc. vs. Broward County, Florida and CH2M-Hill, Inc. Taxiway Paving Distress and Subgrade Preparation, Ft. Lauderdale, FL. Expert witness to evaluate subgrade preparation related to settlement and rutting of a new taxiway at the Ft. Lauderdale Airport.

Deposition, Bahama Bay II Condominiums, Orlando, Florida. Expert witness evaluating claim that a sinkhole impacted buildings beyond the area of the single building immediately adjacent to the sinkhole.

Deposition and Trial, Monaco Hotel Damage Claim, Sunny Isle Beach, Florida. Expert witness defending contractor constructing a new condominium against claims that the construction vibrations and dewatering impacted an adjacent property.

Deposition, I-71 and MLK Interchange, Cincinnati, OH. Expert witness representing the contractor in a claim that there was an inaccurate quantity takeoff during the prebid process that resulted in underestimating the construction cost of the project.

CV of Dr. Michael Oakland, P.E.

Dr. Oakland has over 35 years of experience conducting geotechnical investigations and providing foundations design recommendations for projects worldwide. He has been the lead geotechnical engineer on hundreds of projects requiring all types of foundation systems including driven piles, drilled piles, deep shafts, load bearing elements, ground improvement, shallow foundations and hybrid system of all kinds. As part of his graduate studies at Purdue University, he was involved in research related to the cause and stabilization of highway slopes constructed of compacted shale which was a particular problem throughout the Midwest at that time. Later, while working as a geotechnical engineer at Haley & Aldrich, Inc. in Cambridge, Massachusetts, part of his responsibilities were to serve as the manager of instrumentation services which directly involved him in numerous projects including pile load test, pile driving vibrations and other related construction monitoring. He has prepared numerous papers including several for the Deep Foundations Institute.

Dr. Oakland continues to work as a geotechnical expert on numerous projects throughout the country. Last year, Dr. Oakland chaired a session of the Structural Congress in Boston specifically on instrumentation used to monitor structural performance. He is also on the Massachusetts State Building Code Geotechnical Advisory Committee.

Education
PhD, Purdue University, West Lafayette, ID, 1986, Civil Engineering
MSCE, Purdue University, West Lafayette, ID, 1981
BSCE, Pennsylvania State University, University Park, PA, 1980

PE Registration
MA (35487) 1990, Civil Engineering; Also OH, NJ, KY, MI, NY, RI, PA, AL, TX, FL and IN.

Affiliations
American Society of Civil Engineers (ASCE)
Association of State Dam Safety Officials
Boston Society of Civil Engineers
Geotechnical Group Chairman, 1995-1996
Computer Group Chairman, 1990-1991
Massachusetts State Building Code Committee
Deep Foundations Institute

Representative Project Experience

Expert Consultant, Corridor H Bridge Pier Movement, Kerens, WV. Dr. Oakland is currently serving as an expert evaluating the cause and remediation for a deep seated

landslide that impacted bridge piers under construction at one of the bridges along the corridor construction.

Woerd Ave Bridge Replacement, Waltham, MA. Provided foundation design recommendations for mini-pile foundations and abutment walls for design and construction of a new bridge to replace the 100 ft. span over a tributary to the Charles River.

Value Engineering Geotechnical Expert, Tank and Vehicle Bridge Replacement, Ft. Hood, TX. Served as the geotechnical expert on a value engineering team to review the design of a new bridge to replace a low level stream crossing for both tanks and vehicles within Ft. Hood.

I-90 Bridge and Deck Replacements, MassPike, MA. Conduct a site investigation and provide foundation design recommendations for the reuse of existing bridge piers at two bridge and the replacement of two bridge piers as part of a deck replacement program.

Willis Ave. Bridge Replacement, New York, NY. Design of steel sheet pile cofferdams for access and containment of debris and blast pressures during demolition of existing granite pier cofferdams using blasting.

I-195 Bridge Seismic Retrofit, New Bedford, MA. Provided foundation design recommendations for modification of bridge piers and infill embankments as part of evaluation of various options related to seismic retrofit. Options included evaluation of additional foundations, new piers, tiebacks and mechanically stabilized walls.

West Thames Ave, New Pedestrian Bridge, New York, NY**.** Provided foundation design recommendations for a new pedestrian bridge including drilled pile recommendations, lateral load parameters and other criteria for the support of the new bridge.

Houston Ave. Bridge Evaluation, New York, NY. Made evaluations of lateral spring constants of the existing bridge piers using L-Pile in order to define seismic spring constants for evaluation of a new deck planned for the bridge.

World's Fair Pedestrian Bridge Reconstruction, Queens, NY. As part of a project to rehabilitate the pedestrian bridge used as part of the 1964 World's Fair in New York, Dr. Oakland inspected the existing wood pile and provided recommendations for reconstruction of damaged piles.

Route 2 Highway Bridge Underpinning, Billerica, MA**.** As part of the design of a new water treatment plant in Billerica, the access road to the plant which crossed below the highway required additional headroom. The bridge foundations were underpinned to allow lowering of the access roadway.

Central Artery D9A Viaducts, Boston, MA. Dr. Oakland provided all vertical and lateral load parameters for design of the drilled pier and pile supported viaducts. His work included extensive use of L-Pile to assess lateral deformations and stresses in the foundation elements.

Broadway Bridge Replacement, Boston, MA. As part of the Central Artery D9A, the alignment of the Broadway Bridge was changed requiring a new bridge over the South Station railroad yard. Dr. Oakland developed foundation design recommendations for the new bridge including support on new 14 inch prestressed precast piles to avoid problems with the corrosive soils and stray electric currents in the yard.

Central Artery North Area, Boston, MA**.** As an early phase to the Central Artery, new bridge structures where constructed on the north side of the Charles River in Charlestown. Soil conditions in the area included deep soft clays. Dr. Oakland was responsible to specify and oversee construction of surcharge systems including wick drains to consolidate soils below transition abutments for the ramps to the bridges.

Park Row Pedestrian Bridge, New York, NY. Dr. Oakland developed an exploration program and provided design recommendations for a new pedestrian bridge adjacent to the existing police building in lower Manhattan. The new bridge is to be supported on drilled in minipile foundations to avoid impact to the existing adjacent buildings.

Hillside Avenue Bridge over Cross Island Parkway, Queens, NY**.** Dr. Oakland developed an exploration program and provided recommendations for replacement or repair of the current bridge to assist with evaluation of options for the upgrading the distressed bridge.

Union Turnpike Bridge over Cross Island Parkway, Queens, NY. Dr. Oakland developed an exploration program and provided recommendations for replacement or repair of the current bridge to assist with evaluation of options for the upgrading the distressed bridge.

Confidential Project, New York City Area**.** Provided recommendations for installation of security barriers around bridge piers.

Sakonett Bridge Pier Review, Sakonett, RI. Dr. Oakland participated in a value engineering evaluation of the proposed foundation design of a new highway bridge to replace an existing bridge. The new bridge was to be supported on a combination of 14 inch H-Piles and 72 inch diameter driven pipe piles.

NYC Department of Transportation, Evaluation of Pavement Distress on the FDR Drive, New York, NY. Dr. Oakland developed an exploration program and evaluated the results of testing to assess pavement distress of the FDR Drive on the east side of Manhattan below the United Nations plaza deck to assess long term reconstruction of the roadway. (2006)

NYC Department of Transportation, Brooklyn Bridge Bulkhead Evaluation, Brooklyn, NY. As part of the erection of a water sculpture below the Brooklyn Bridge in front of the Brooklyn Pier, Dr. Oakland provided an assessment of the condition of the bulkhead and provided recommendations for repairs to the bulkhead and support of the 90 ft. high sculpture. (2007)

Expert Consultant, Kinder Morgan Fuel Storage Tank Settlement, Houston, Texas. Dr. Oakland is currently serving as an expert for of settlements of a fuel storage tank recently constructed on controlled modulus columns at a large tank farm. The settlements were

determined to be the result of unanticipated highly organic soft soils which cause a discontinuity in the CMC ground improvement.

Expert Witness, Runway Paving Distress and Subgrade Preparation, Ft. Lauderdale, Florida. Dr. Oakland served as an expert for evaluation of subgrade preparation related to settlement and rutting of a new taxiway at the Ft. Lauderdale Airport. Work includes review of the project compaction criteria, fill placement, subgrade compaction and over-excavation and replacement of unsuitable soils. Testified in court on behalf of the defendant.

Expert Witness, Grand Avenue Bridge Abutment Pile Installation, Des Moines, Iowa. Dr. Oakland served as an expert witness for the City against a claim by the bridge contractor regarding a claim that a change in conditions had been encountered which caused additional work related to installation of drive H-piles and sheet piles as well as other abutment construction issues. Testified in court on behalf of the defendant.

Expert Witness, MLK Interchange Construction, Cincinnati, OH. Dr. Oakland served as an expert witness on behalf of the contractor to review prebid design drawings use by the contractor for bidding of a design build project after the final design resulted in substantially more wall area required to construct the project.

Expert Witness, Tryp Hotel Building Settlement, Ft. Lauderdale, FL. Dr. Oakland served as an expert witness on behalf of the general contractor to evaluate the cause of settlement for a new 8 story hotel supported on ground improvement. Dr. Oakland reviewed all settlement data, evaluated subsurface conditions and conducted a detailed test pit program to exhume and document the as constructed condition of a typical stone column. The evaluations and physical evidence indicated that the stone columns were not designed or installed in accordance with the site requirements. Presented in mediation for the defendant.

Expert Witness, Failed Reinforced Earth Retaining Wall, Creve Core, Missouri. Dr. Oakland served as an expert witness for evaluation of the cause of a 40 ft. high reinforced earth retaining wall being constructed as part of a condominium construction project. The wall failed during a heavy rainstorm along its entire length. Dr. Oakland is supporting the insurance carrier to define the cause of the wall failure and coverage that applies to the wall's reconstruction.

Expert Witness, Ft. Calhoun Mine Claim, Ft. Calhoun, OK. Dr. Oakland served as an expert witness Martin Marinette, the mine owner, against the contractor claiming a substantial extra for construction of a new tunnel decline to access the mine. The claim included evaluation of bedrock properties and mine construction that resulted in failed rock bolts and excessive slaking of the tunnel walls and roof. Testified in mediation for the defendant.

Expert Witness, Dam Embankment Performance Claim, Cullman, Alabama. Dr. Oakland served as an expert witness related to investigation of the performance of a new water supply dam constructed for the city. His work includes evaluation of the clay core and assessing it's as built performance.

Expert Witness, Monico Hotel Building Damage Claim, Sunny Isles Beach, FL. Dr. Oakland served as an expert witness for the in a claim that construction of piles and dewatering construction damage an adjacent hotel. The expert services included providing opinions on causation of settlement, groundwater dewatering, cutoff walls, monitoring instrumentation and other aspects of foundation construction. Testified in court on behalf of the defendant.

Expert Witness, Commercial Development Slope Failure, El Paso, Texas. Dr. Oakland served as an expert witness for a developer after a slope, being constructed to specifications developed by his civil engineer, failed during construction. Alterations to the grading greatly reduced the available building space and development potential of the property.

Expert Witness, Settlement of Bellevue Hospital during Construction of New Building, New York, New York. Dr. Oakland served as the expert for the defendant as part of arbitration related to settlement of the existing Bellevue Hospital during installation of steel sheet piling and other construction activities as part of construction of a new DNA Forensic Laboratory facility adjacent to the hospital. Presented in mediation.

Expert Witness, Bahama Bay II Sinkhole Investigation, Orlando, FL. Dr. Oakland served as an expert witness for the insurance carrier related to claims of wide spread sinkhole activity at a new condominium development. Conducted test borings and GPR surveys to identify the actual bounds of the sinkhole activity.

Expert Witness, Pipe Cradle Failure, South Haven, MI. Dr. Oakland served as an expert witness the designer in a claim related to failed bolts supporting a pipe cradle for new sewer lines. Work included assessment of wood pile connection details and services loads on the pipe cradle. Presented in mediation for the defendant.

Expert Witness, Evaluation of Distress to 8-18 Main Street due to Water Main Installation, Medford, Massachusetts. Dr. Oakland evaluated the potential for excavating for a new water main to have caused claimed damage to an adjacent property. Dr. Oakland was retained on behalf of the Contractor's Insurance Company. Successfully demonstrated that all work was outside of the zone of influence and that damage was a pre-existing condition.

Technical Expert, Evaluation the Impact of Construction on a 316 Stuart Street, Boston, Massachusetts. Dr. Oakland was retained to evaluate the potential for damage to an existing 4 story building which abutted the site a new 5 level deep excavation for a new office tower. Dr. Oakland used finite elements to identify areas of potential concern and the extent of the movement then developed an instrumentation system to specifically monitor the critical aspects of the building.

Expert Witness, Evaluation Building Movement and Underpinning Repairs, Port Imperial Condominiums, West New York, New Jersey. Dr. Oakland evaluated settlement data and the performance and condition of condominium units which had settled and provided recommendations for repairs and underpinning.

Expert Witness, Evaluation of Pipe Jacking Failure during Construction, I-595 Managed Lanes Project, Ft. Lauderdale, Florida. Dr. Oakland developed an investigation program and identified the cause of failure of a 54 inch diameter pipe used as part of trenchless microtunnelling operation used to install a new storm drain below an existing highway.

Technical Expert, Evaluation Building Movement during Construction, Boston, MA. Dr. Oakland reviewed reported building movements which resulted from underpinning and deepening building foundations during renovation of a 4 story brownstone apartment building in the South End area.

Distressed Oil Storage Tank Foundations, Philadelphia, PA. Conducted field investigations and numerical modeling to assess the cause of drag-down on piles supporting 10 oil storage tanks and the impact to slab foundations for the tanks. Installed instrumentation and conducted full scale load tests for each foundation system and provided recommendations for safe fill levels in each tank

Evaluation of Pavement Distress, FDR Drive, New York, NY. Dr. Oakland developed an exploration program and evaluated the results of testing to assess pavement distress of the FDR Drive on the east side of Manhattan below the United Nations plaza deck to assess long term reconstruction of this portion of the roadway. Pavement distress was the result of differential settlement where pavements overlied pile caps from the overhead building.

Castle Village Retaining Wall, New York, NY. Provided final design and construction oversight of reconstruction of a 75 ft. high retaining wall which collapsed and partially blocked the Henry Hudson Parkway in northern Manhattan. Work included explorations for design, design details, instrumentation to monitor wall movement and responding to reviews and criteria of City agencies including the DOB and Highway Department.

Principal Investigator and Expert Witness, Private Residence, Brookline, MA. Dr. Oakland provided an engineering evaluation and expert witness testimony for settlement of an historic mansion caused by loss of ground through an adjacent soldier pile and lagging support system for adjacent construction. Work included design and monitoring of a grout stabilization system for the house foundations.

Principal Investigator and Expert Witness, Condominiums Settlement Remediation. Dr. Oakland provided an engineering evaluation and expert witness testimony for the settlement of a parking area and driveway loop at the entrance to luxury condominiums, due to improper surcharging of the peat below the site.

Technical Witness, Value Engineering Change Order, 2 mil. gal. Water Storage Tank, Deer Island, MA. Provided technical testimony and expert witness consultation related to a geotechnical change order during construction of a new elevated water storage tank on Deer Island as part of the 1.25 billion gal. per day waste water treatment plant construction of the City of Boston.

Principal Investigator and Expert Witness, Scaffolding Collapse Investigation, Quincy, MA. Dr. Oakland provided an engineering evaluation of the foundation support for a 125 ft.

high scaffolding that collapsed killing three workers, as part of the investigation into the accident. Work included conducting model testing of the soils below the scaffolding and prediction of the differential settlement which may have occurred between the scaffolding legs.

High Rise Building Excavation and Remediation. Dr. Oakland provided an engineering evaluation of building settlement and lateral movement of a pile supported high rise structure during excavation of an adjacent deep excavation. Work included providing detailed instrumentation to monitor the movements and design of supplemental support of the excavation to reduce movement of the structure. An evaluation was made of the impact of the movement on the permanent support of the building.

Infiltration Gallery Remediation, Bethlehem, NY. Dr. Oakland provided an engineering evaluation and recommendations for remediation of a river bank infiltration gallery which was yielding 25 percent less of the raw water supply then predicted.

Settlement Evaluation of Adkins Water Treatment Facility, Greenville, SC. Dr. Oakland investigated the settlement of existing clarifier basins prior to construction of additional basins at the plant. The site is underlain by loose sands and silts which consolidated under the weight of the basin. Remediation to stabilize the basin against further settlement consisting of compaction grouting was designed. The grouting uses low slump grout injected under pressure to compact the existing soils below the basin.

Building Settlement Inspection, Victoria TX. Dr. Oakland conducted an inspection of an electrical building that settled up to 12 inches after construction. Settlement was due to fill or disturbed soils below one half of the building causing significant differential settlement. Underpinning piles where designed to support the building.

Technical Expert, Sheetpile Movement Evaluation, New York, NY. Dr. Oakland provided an engineering evaluation of sheet pile movement for an excavation to remove and replace fuel oil tanks at a large independent community project in New York. The sheetpile movement caused damage to a City park and playground equipment as well as the adjacent boiler building at the site. The movement was due to improper blocking and bracing installation.

Publications and Presentations

“Real Time Monitoring of The Historic Old South Church, Boston, Massachusetts” with Pierre Gouvin, Deep Foundations Institute Annual Conference, Oakland, CA, October 2015.

“Analysis and Performance of Sheet Pile Cofferdams under Demolition Blast Loads,” with John Mould, Gordon Chen and William McElwee, Deep Foundations Institute, Annual Conference, Houston, TX, October, 2012.

“Design and Analysis of Cooling Tower Pile Foundations,” with Gordon Chen and Robert Smith, Deep Foundations Institute, Annual Conference, Los Angeles, CA, October, 2010.

"Evaluation and Testing of Distressed Pile Foundations Supporting Oil Storage Tanks," Deep Foundations Institute, Annual Conference, Kansas City, MO, October, 2009.

"A Culvert for Abram Creek" with J. Aldrich and M. Vilem, published in Civil Engineering Magazine, ASCE, November 2003.

"Retirement isn't the End of a Historic Dam's Career" with I.M. Bolender, Annual Conference of the Association of State Dam Safety Officials, presented at the Annual Conference, Minneapolis, MN, September 2003.

"The Abram Creek Culvert: How Burying 1 mile of Stream Allowed Cleveland's Airport to Expand" with J. Aldrich and M. Vilem, Proceedings of the Annual Conference of Pipelines 2003, ASCE, presented in Baltimore, MA, July 2003.

"Analysis of Two High Rise Structures Adjacent to a Deep Excavation" by M.W. Oakland, R.E. Griffith and M.J. Sklar , Pan American Conference on Soil Mechanics, ASCE, MIT, Cambridge, MA published in May 2003.

"Structural Design Using Jet Grouting" principal invited speaker in a short course presented by Hayward Baker at the Third International Conference, ASCE and the Deep Foundations Institute, presented in New Orleans, LA, February 2003.

"Compaction Grouting Used for a Water Treatment Plant Expansion" by M.W. Oakland and M.L. Bachand, Grouting and Ground Treatment, Proceedings of the Third International Conference, ASCE and the Deep Foundations Institute, presented in New Orleans, LA, February 2003.

"Design-Build of a Jet Grout Access Shaft for Tunnel Rehabilitation" by M.W. Oakland, M.J. Ashe, J.R. Wheeler and R.C. Blake, North American Tunneling 2002 Annual Conference, Presented in Seattle, WA, May 2002.

"Repair of Three Partial Demolished Dams" presented to the poster session of the National Convention of the Association of State Dam Safety Officials, Salt Lake City, UT, September 2001.

"Geotechnical Considerations for Raising Reservoir Dams" presented to the Northeast Section of the Association of State Dam Safety Officials Conference, Hershey, PA, July 2001.

"Deep Foundations Used on Deer Island," Deep Foundations Institute, Annual Conference, Boston, Massachusetts, October 1994.

"Economical renovation of Small Dams," Association of State Dam Safety Officials Annual Conference, Baltimore, Maryland, September 1992.

"Analysis of Drilled Piers Used for Slope Stabilization," with J.L. Chameau, presented to the TRB Session on Highway Embankments, Washington, D.C., January 1989.

"Building Embankments with Shale," with C.W. Lovell, Proceedings of the 26th Symposium on Rock Mechanics, 1985, and presented to the 26th U.S. Symposium on Rock Mechanics, South Dakota School of Mines, Missouri, July 1985.

"Finite Element Analysis of Drilled Piers for Slope Stabilization," with J.L. Chameau, ASTM Special Technical Publication, No. 835, Laterally Loaded Deep Foundations: Analysis and Performance, 1984, presented to the ASTM Specialty Conference on Laterally Loaded Piles, Kansas City, Missouri, June 1983.

"Classification and Other Standard Tests for Shale Embankments," with C.W. Lovell, Joint Highway Research Project, No. 82-4, Purdue University, West Lafayette, Indiana, February 1982.

"Standardized Tests for Compacted Shale Highway Embankments," with C.W. Lovell, Transportation Research Record, No. 873, Transportation research Board, February 1983. Presented to the TRB session on weak rocks, Washington, D.C., January 1981.

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